TIDAL OBSERVATIONS IN THE RIVER THAMES.

DRAINAGE OF THE METROPOLIS.

A SERIES of tidal observations were made in the River Thames between the 19th June and the 19th July of the present year, in connection with the metropolitan survey. Tidal observations of the kind, taken simultaneously at different stations, and referable to the same datum, are at any time interesting, but at the present time, when the general drainage of the metropolis occupies so large a share of public attention, and when the question of continuing or discontinuing the river as the main sewer in that drainage, must necessarily be discussed in its various bearings, they become of more than ordinary professional interest.

The stations or gauges at which the observations were taken were three in number; one in Deptford-reach, another at London-bridge, and the third at Battersea-pier, near the Red-house. The observations were registered every 10 minutes from 6 a.m. to 6 p.m., and the correct time of each observation was determined by means of a marine chronometer at each station, set to Greenwich mean time.

The zeros of the gauges were connected by careful levelling; hence their relative level as well as that of the surface of the water in the river at all states of the tide was easily ascertainable.

It was found that there was a considerable difference in the time of the high and low water at the three stations. The greatest interval of time between the high water being—Deptford, before London-bridge, 20 minutes, and before Battersea, 45 minutes. The least interval of time of the high water was, Deptford, before London-bridge, 5 minutes, and before Battersea, 30 minutes; and the mean interval of time during the month's observations was, Deptford before London-bridge, 12 minutes, and before Battersea, 36 minutes.

The greatest interval of time between the low water at the three stations was, Deptford, before London-bridge, 55 minutes, and before Battersea, 90 minutes; the least interval of time was, Deptford, before London-bridge, 13 minutes, and before Battersea, 63 minutes; and the mean interval of time during the month's observations, was Deptford before London-bridge, 24 minutes, and before Battersea, 73 minutes. The interesting fact is deduced from this variation of time of high and low water, that the tide is, when near the time of high water, flowing for a period of 30 to 45 minutes in opposite directions, that is to say, at Battersea it is flowing up the river at the same time that it is flowing down the river at Deptford, the intermediate points being affected to a corresponding extent, according to their relative position. The counter currents about the time of low water, continue for a longer period, the current of the ebb stream at Battersea flowing down the river for an hour or an hour and a half after the flood stream has set up the river at Deptford. Hence it appears that about the time of high water, there is a counter tidal current within the limits of dense population, of half an hour or three quarters of an hour in duration; but inasmuch as these opposite currents are separating, or receding from each other, that is, the part highest up the river flowing still higher, while at the places situated lower down the river, the water is flowing towards the sea, it may be supposed that the agitation in the mass of water produced thereby is inconsiderable. In the case of the low water period, however, the matter is very different. Here it will be observed, while the water is at or near its lowest diurnal level, and consequently when all the sewers of the metropolis discharge their contents upon the diminished stream, or upon the half-dried mud which the recession of the tide has left bare, while at the same time a hundred river steamers, and vessels of all kinds and dimensions, are agitating the river, and stirring up the mud from the very bottom of its bed, two opposing currents of the tide are rushing towards each other from Battersea to Deptford, which meet about midway, or somewhere between London and Waterloo-bridges.

The relative level of the high and low water at the different parts of the river, as well as the relative level of the several parts at the same instant of time, during the entire ebb and flow of the tide throughout its whole age, must obviously enter largely into the discussion of any general scheme of sewerage which contemplates using the Thames as the main artery of its system. The following results bear on this point:—

The mean difference of level of the high-water at the three stations was, Deptford lower than London-bridge, 0·25 feet; and higher than Battersea, 1·03 feet. The main difference of the level of the low-water at the three stations was, Deptford lower than London-bridge, 0·59 feet; and lower than Battersea, 1·98 feet.

The greatest range of tide during the month was at	Deptford ..	21·35 feet.
	London-br.	20·65 ,,
	Battersea ..	16·70 ,,
The least range of tide during ditto.....	Deptford ..	14·76 ,,
	London-br.	14·50 ,,
	Battersea ..	12·70 ,,
The mean range of tide during ditto.....	Deptford ..	17·91 ,,
	London-br.	17·51 ,,
	Battersea ..	14·91 ,,
Giving a mean range of tide for the river between Deptford and Battersea of ..		16·78 ,,

This affords fair data for ascertaining the approximate volume of water which ebbs and flows twice a-day, and, consequently, of the quantity to be contaminated by each individual or family of the entire population. The area of the river from Deptford Dockyard to Battersea Pier is about 1,360 acres; and we have in each acre, according to the average range of tide here stated, 730,937 cubic feet, or 4,554,000 gallons, giving a total quantity in the whole area of 6,193,440,000 gallons for a single average tide, or 12,386,880,000 gallons during each twenty-four hours. Now, allowing that the population contaminating this mass of water is 2,000,000, there will be for each individual an average quantity of 6,193 gallons, or upwards of 30,000 gallons for each average family of five persons.

Different minds will draw very different inferences from these matters of fact. Some will say that, with this quantity of water for each individual, or family, it would be utterly impossible to render the whole mass so dangerously polluted as it is stated to be; whilst another class, from their assumed knowledge of numerous collateral and constantly recurring sources of contamination, will probably arrive at a totally opposite conclusion. One thing, however, may be stated as certain—namely, that the whole question cannot be fairly discussed by taking an isolated view of the facts, or with an imperfect knowledge of them.

Great diversity of opinion has been expressed with respect to the quantity of contaminating matter which passes into the Thames from the sewers of the metropolis, and the proportion which it bears to the quantity of water in the river. Mr. Chadwick, at a recent meeting of the Commissioners of Sewers, stated this proportion to be as 1 to 10,000; this, however, can only be taken as a conjecture. The following considerations will aid in forming as correct an opinion upon the subject as the imperfectly known facts will warrant.

The area of the metropolitan district drained by the part of the river Thames here under consideration, is about 24,000 acres, or nearly 40 square miles. The annual quantity of rain falling in the metropolis is about 21 inches, which gives for this area of dralnage about 11,397,300,000 gallons. Of this quantity, one-half probably passes away by evaporation, and the other half, or a daily average of about 15,600,000 gallons, passes through the sewers into the Thames.

Another source of supply is from the water pipes. The quantity of water supplied daily by the several water companies to the metropolis in 1833 was stated, before a Parliamentary Committee to be 35,000,000 gallons (a quantity scarcely credible). To this may probably be added, on account of increase of population, &c., 20 per cent., or 7,000,000 gallons, giving a total of 42,000,000 gallons, or 21 gallons daily for each individual, at the present time. Assuming that one-fourth of this quantity passes into the waste pipes, and thence into the sewers, we have 10,500,000 gallons per diem passing into the river from this source, which, added to the average daily quantity of 15,600,000 derived from rain, gives a total daily average of 26,100,000 gallons. Or, adding to this that which is supplied through the natural channels of streams derived from sources exterior to the area of drainage, the average daily quantity may be set down at 30,000,000 gallons supplied from all sources for the cleansing of the sewers. It is, however, obvious that as the portion derived from rain is fluctuating in its supply, although the daily average throughout the year may be 30,000,000 gallons, the actual daily supply for sewer-cleansing purposes in dry weather may be as low as half that quantity, while in rainy seasons the daily supply may rise to 45,000,000. In the former case there would be about a proportion of one gallon of polluted sewer water to 800 gallons of tidal water, and in the latter case it would be as one gallon to 267 gallons. The purity of the water in the river would, however, be as much deteriorated in the one case as in the other, as an equal quantity of soil must necessarily be cleansed from the sewers in both cases; the only difference would be, that with the more copious supply of water the soil would be in a more diluted shape, but not on that account in greater quantity.

It may be fairly expected that in some of the numerous plans of sewerage to be shortly laid before the Commissioners of Sewers, this important subject will be fully discussed. To do so, however, the fact must not be lost sight of, that as the tidal wave is to a certain extent oscillating in estuaries, or rivers like the Thames, it cannot be supposed that the whole of the semi-diurnal additions of drainage impurities can pass completely away with each tide; we know, indeed, that they do not; and it becomes a matter of vital importance to ascertain the *progressive* amount of these accumulating impurities. It is as absurd to pretend that the water of the Thames is uncontaminated, while it is used as the main sewer, as to expect the purity of a mountain stream in a river on whose banks 2,000,000 of the most restlessly active people in the world exist.

IMPROVEMENT OF WROUGHT-IRON WATER-PIPES.

IN your number of the 11th of August a paragraph was inserted stating that Messrs. Fox and Henderson had purchased the license for the manufacture in England of the wrought-iron pipes, upon the patent of M. Chameroy. This paragraph escaped my notice until very recently, but as it is always better late than never, perhaps you will allow me through your columns, to call the attention of these gentlemen, and of the profession, to some defects in the use of these pipes. I do this, because the defects are susceptible of being remedied; and the parties would render a real service to all interested in drainage and water-works, were they to succeed in the attempt.

Firstly. The tubes, or pipes (as I have seen them employed in Paris, and in other French towns), are not made sufficiently strong to resist the pressure from without. The weight of the earth above them, combined as its action often is with a settlement below (for most water pipes are laid in made ground), forms indents which diminish the volume of water delivered. But as the indent is not always accompanied by a leakage, it is very difficult and expensive to ascertain where the obstruction occurs. I have known nearly a mile of pipe laid bare to find the cause of the diminished delivery. In fact, elasticity is not to be desired in a water pipe.

Again. The screw couplings being soldered on, are very likely to be, and often are in practice, detached. It is easily conceivable that an artificial joint of this kind is exposed to minute defects, hardly perceptible by the workmen, but which the continual action of the water, with a "head" such as is required for the high service, cannot fail to discover, and also to aggravate.

In France the screw socket pipes were used for lengths of about 80 feet, and then flange pipes were introduced to admit of repairs in case of accident. Great inconvenience arose from this great length between the flange joints; for it is invariably found that the oxidation of the iron in the worm of the screw joints, made these last adhere together so firmly, that it was next to impossible to separate them; or at least the solder between the screw flange and the tube was so much detached, that the water, when reintroduced,

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